



EA-03-009

Palo Verde Nuclear
Generating Station

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102-05070-CDM/SAB/RJR
March 11, 2004

U.S. Nuclear Regulatory Commission
Office of Secretary of the Commission
ATTN: Rulemakings and Adjudications Staff
Washington, DC 20555-0001

Reference: Letter 102-05031-GRO/SAB/RJR, "Relief Request No. 24 – Request for Relaxation of NRC Order EA-03-009, Section IV.C.(1)(b) Requirements for the Reactor Head Vent Nozzle," dated January 14, 2004.

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2 and 3
Docket No. STN 50-528, 50-529 and 50-530
Relief Request No. 24 - Request for Additional Information**

In the Reference above, Arizona Public Service Company (APS) submitted a request for relaxation to NRC Order EA-03-009, Section IV.C.(1)(b) requirements. A telephone call was held between the NRC staff and members of PVNGS on February 18, 2004, where additional information was requested by the NRC concerning this relaxation. The attachment to this letter contains APS' responses to the NRC's questions on Relief Request No. 24 for the PVNGS reactor head vent nozzle.

No commitments are being made to the NRC in this letter. Should you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,

CDM/SAB/RJR/kg

Enclosure: Response to the Request for Additional Information for Relief Request No.24.

cc:

J. E. Dyer	(w/attachment)
B. S. Mallett	(w/attachment)
M. B. Fields	(w/attachment)
N. L. Salgado	(w/attachment)

A101

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Response to RAI on Relief Request No. 24

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Assistant General Counsel for Materials Litigation and Enforcement (w/attachments)
U.S. Nuclear Regulatory Commission
Washington, DC 20555

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Enclosure

**Response to the Request for Additional Information for Relief
Request No. 24**

Response to the Request for Additional Information for Relief Request No. 24

On January 14, 2004, Arizona Public Service Company (APS) submitted a request for relaxation to NRC Order EA-03-009, Section IC.C.(1)(b) requirements. A telephone call was held between the NRC staff and members of PVNGS on February 18, 2004, where additional information was requested by the NRC concerning this relaxation. Below are APS' responses to the requested information.

NRC Question 1

How was the vent plug installed? Is there a crevice between the OD of the plug and the ID of the vent penetration nozzle?

APS Response

The reactor head vent nozzle orifice was installed using a welded partial penetration design between the inside diameter of the vent nozzle and the outside diameter of the orifice. The welding process used was gas-tungsten arc welding (GTAW) using E82 electrode. This welding process typically results in smaller heat affected zones and the weld electrode has more chromium (20%) vs. 182 shielded metal arc welding (SMAW) coated electrode (14%). The additional chromium results in more weld primary water stress corrosion cracking (PWSCC) resistance.

The installation procedure for the orifice required an opening of .747" (+.006"/-.000" diameter) and if not met, then the nozzle was counterbored (see the response to Question 3). Based on design drawing dimensions, a 0.001 to 0.005-inch radial gap exists between the orifice and inside diameter of the nozzle. This annular region is exposed to primary coolant and it is possible that this gap may be wetted. The vent nozzle was installed into the reactor head with a slip fit. Therefore, any nozzle through-wall or J-weld leakage is expected to be readily detected during bare metal visual examinations performed on the outside surface of the reactor head.

NRC Question 2

Provide the finite element stress analysis as well as boundary conditions used to calculate tensile stresses on the vent penetration nozzle. How was the plug installation modeled? (i.e. cold work, weld residual stresses)

APS Response

The critical stress location in the head vent is in the vicinity of the attachment weld, where residual and pressure stresses have the most impact.

The stress analysis for the vent line penetration is based on a three dimensional finite element model. The analysis considered pressure and thermal transient loads

associated with steady state operation, as well as residual stresses which are produced by the fabrication stresses. This modeling process was used for the CEDM nozzles as well. Figures 5-2 and 5-9 from Westinghouse WCAP 15817-P, Revision 1, are provided below to show the model.

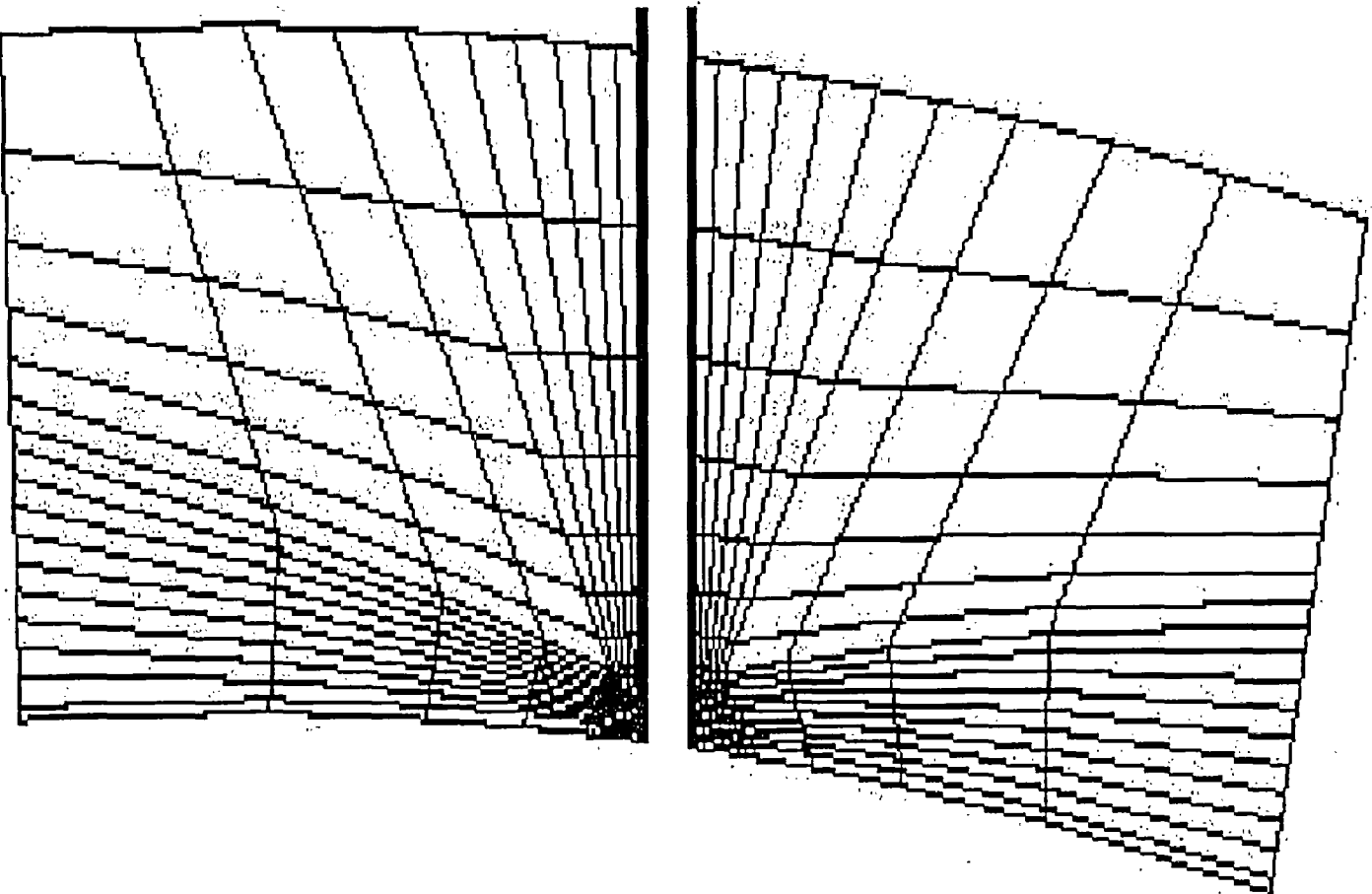


Figure 5-2 Three Dimensional Model of the Head Vent Penetration

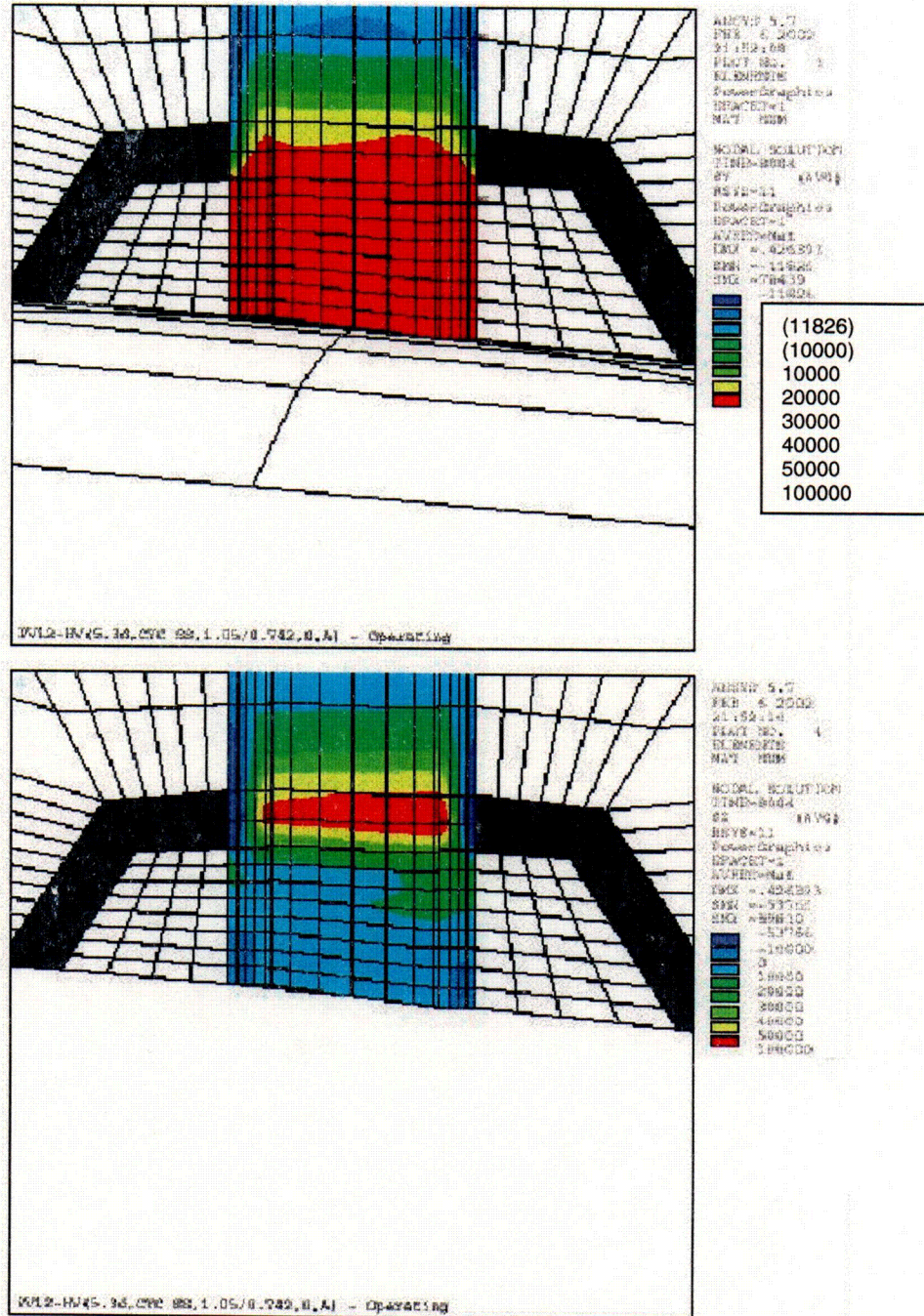


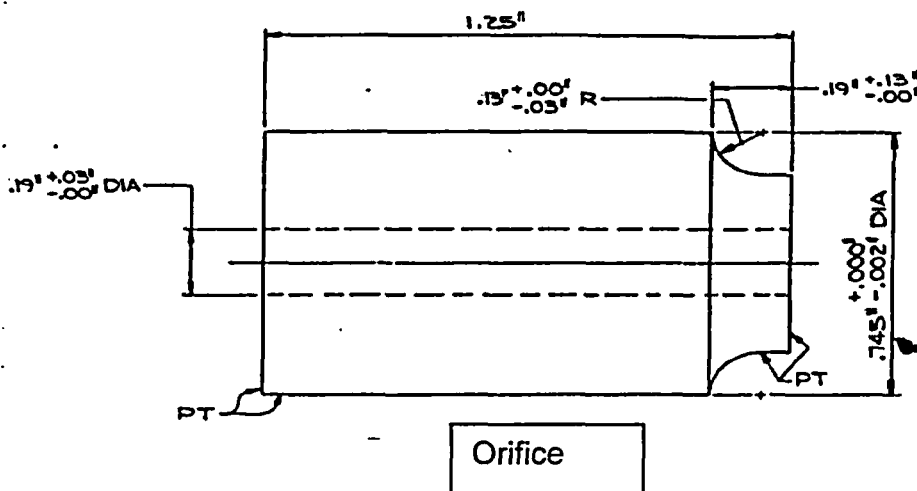
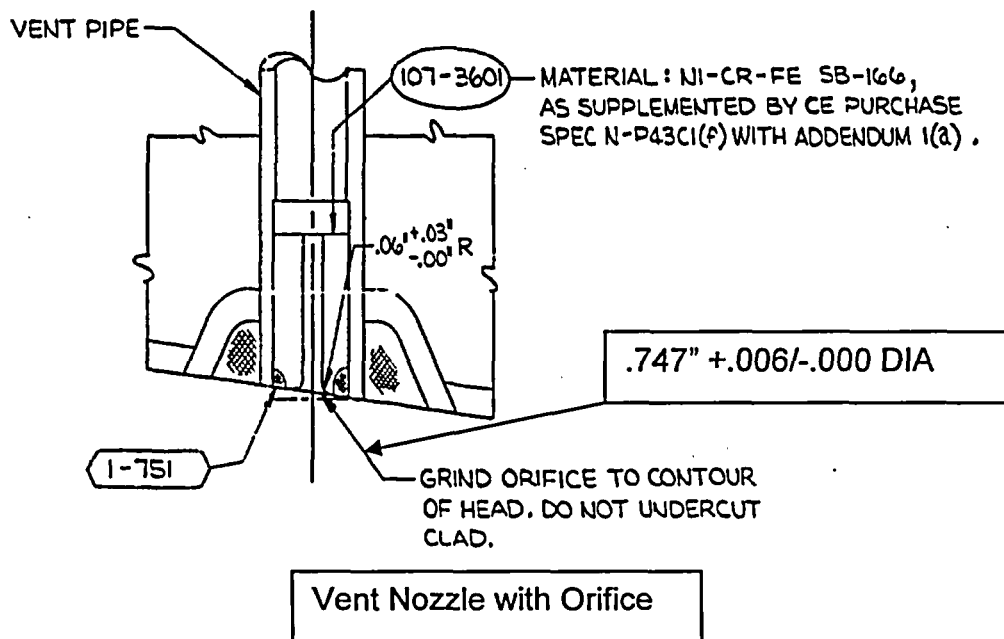
Figure 5-9 Stress Contours in the Head Vent As A Result of Residual Stresses and Operating Pressure (Hoop stress is the top figure; axial stress is the bottom figure)

NRC Question 3

Provide figure of vent penetration nozzle, plug and associated welds with all dimensions.

APS Response

See the drawings below for design details of the vent line nozzle, plug and weld dimensions.

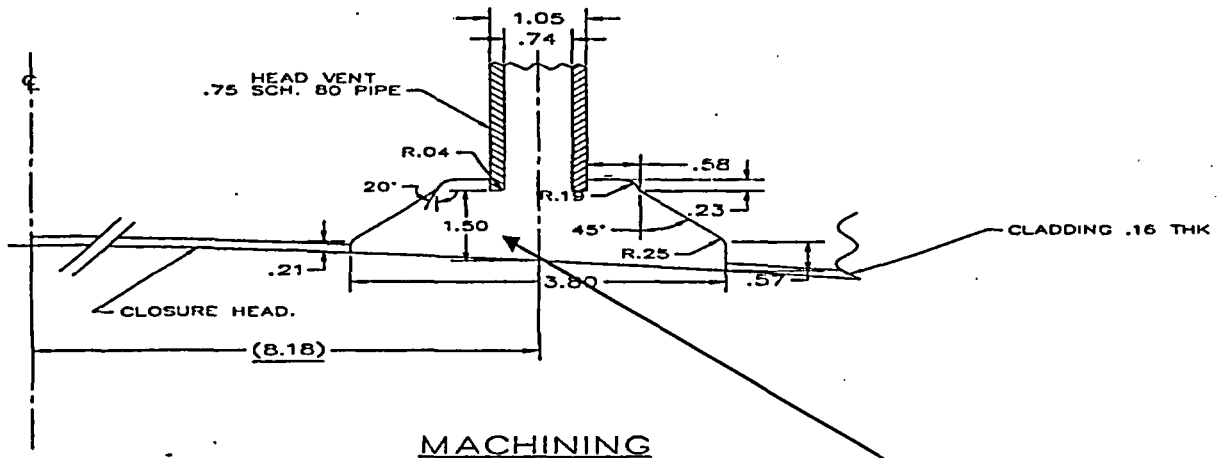


NRC Question 4

Provide additional details on plug removal method including amount of material removed by EDM process.

APS Response

For access to the inside diameter of the vent nozzle, the APS vendor proposes an electrode discharge machining (EDM) process to remove the orifice (see the sketch below). This EDM process would remove the orifice, orifice to nozzle attachment weld, vent nozzle and vent nozzle to reactor head attachment weld. More importantly, a substantial portion of the reactor head material would also have to be removed (a 3.80 inch diameter opening is machined, with 1.50 inches of reactor head material removed). The large amount of material removed facilitates a remote welding head which would be used to re-weld the vent nozzle to the reactor head and the orifice. The reactor head material removed is not replaced by weld material. As a result of current regulatory inspection requirements, this EDM process would be repeated in subsequent outages, ultimately resulting in an unacceptable and impractical configuration.



Units in inches

Note: a 3.80" x 1.50" area of RPV head material is removed by this process

NRC Question 5

Provide support documentation for the statement, "Should PWSCC occur in the high stress region, crack growth predictions for the head vent pipe show a period of greater than 2 years, from the time of initiation, before through-wall cracking occurs."

APS Response

The crack growth rate prediction curve for axial inside surface flaws for the head vent nozzle is provide below (WCAP-15817, Revision1)and shows that in the high stress region, crack growth predictions for the head vent pipe show a period of greater than 2 years, from the time of initiation, before through-wall cracking occurs.

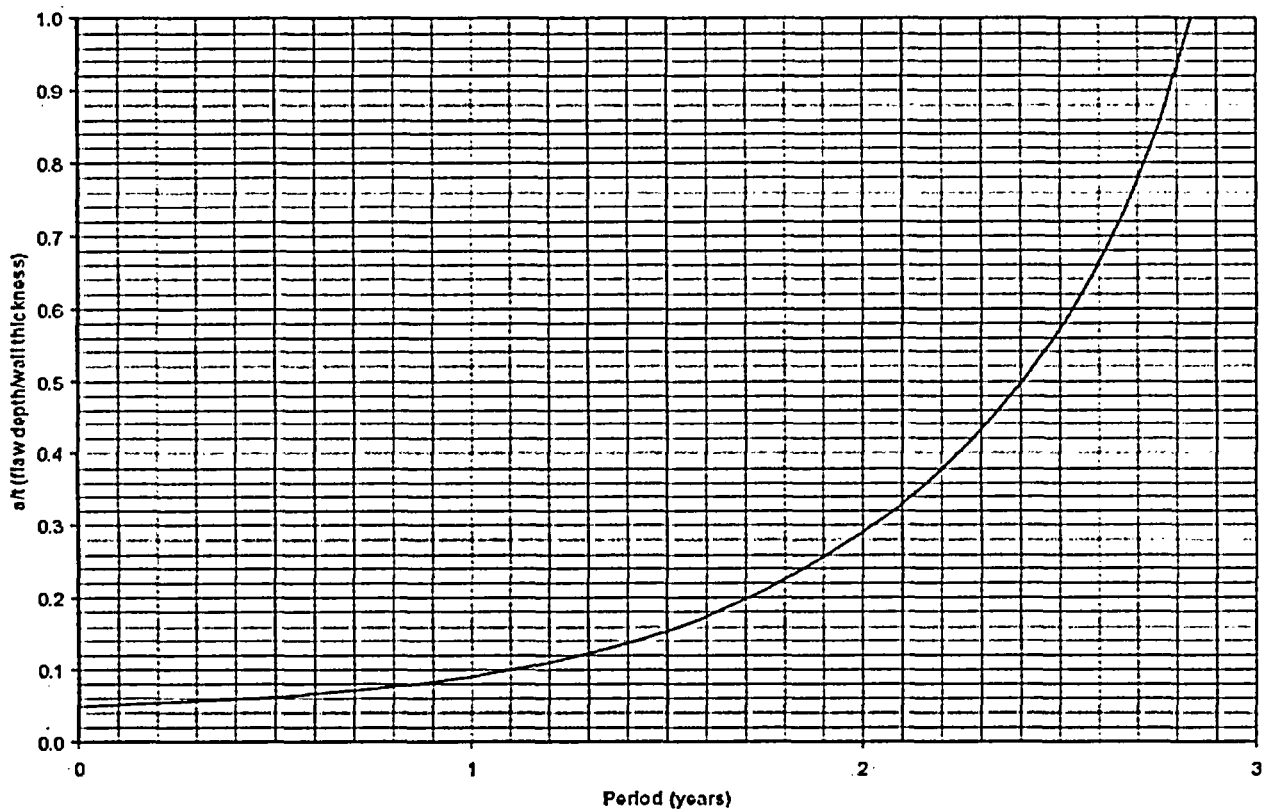


Figure 6-21 Crack Growth Predictions for Axial Inside Surface Flaws – Head Vent